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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/989,050	11/20/2001	Paul W. Bohn	1201.65872	1015
7590 11/06/2003 GREER, BURNS & CRAIN, LTD. Suite 2500 300 S. Wacker Drive Chicago, IL 60606			EXAMINER VINH, LAN	
			ART UNIT 1765	PAPER NUMBER

DATE MAILED: 11/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No.	Applicant(s)	
	09/989,050	BOHN ET AL.	
	Examiner	Art Unit	
	Lan Vinh	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 8/13/2003.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

#### Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All   b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                  | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____  |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)         | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____                                    |

### DETAILED ACTION

1. The rejection of claim 23 under 35 U.S.C. & 112, first paragraph, has been withdrawn in view of applicants persuasive argument.
2. For the purpose of examination, the claim language of "a thickness sufficient to permit nucleation that forms nanometer size metal particles and small enough to prevent formation of a continuous metal layer" is best understood by the examiner as a thickness in the nanometer size.

### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.
4. Claims 1-8, 10, 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Peng et al (US 5,895,223) in view of Przybysz (US 4,353,779)

Peng discloses a method of etching nitride (GaN/Group III-V material). This method comprises the steps of:

partially coating the GaN chip with a metal electrode/layer of Pt (col 4, lines 7-18), which reads on depositing a thin discontinuous layer of metal on a Group III-V material surface

etching the GaN chip in a acidic solution of  $H_3PO_4$ , no voltage bias is required for the etching (col 4, lines 4-42), which reads on etching the Group III-V material surface in acidic solution , the etching being conducted without external electrical bias.

Unlike the instant claimed inventions as per claims 1, 8, Peng does not disclose etching the Group III-V material in a HF and oxidant solution.

However, Przybysz discloses a method for wet chemical etching of Group III/IV material comprises the step of etching Group III/IV material (Ga) in a solution containing HF and  $H_2O_2$ /oxidizer for a period of 60 minutes (col 1, lines 60-65, col 4, lines 10-11)

Since both Peng and Przybysz are directed at methods of etching Group III/IV material in an acidic solution, one skilled in the art would have found it obvious to modify Peng etching step by using the etching solution as taught by Przybysz because Przybysz states that the amount of F- ion being effective to allow sharp uniform etching without precipitation or gaseous evolution at the etching site and the etching solution acts as a particularly effective solvent solution for GaAs/Group III/IV material (col 5-11)

Regarding claim 2, Peng discloses that in one embodiment of his invention, the activation of the etching liquid by the UV light /illumination must be avoided (col 3, lines 56-58)

Regarding claim 3, Peng discloses the step of using UV light /illumination during the etching step (col 3, lines 43-45)

Regarding claims 4-7, Peng discloses that the metal electrode can be Pt, Au, Pd (col 4, lines 117-19)

The limitation of using an oxidizer of  $H_2O_2$  in the etching solution, as recited in claim 8, has been discussed above.

The limitations of claim 10 (etching time) and claim 11 have also been discussed above.

5. Claims 9, 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Peng et al (US 5,895,223) in view of Przybysz (US 4,353,779) and further in view of Yoshikawa et al (US 5,990,605)

Peng as modified by Przybysz has been described above. Unlike the instant claimed invention as per claim 9, Peng and Przybysz do not specifically disclose that the thickness of the metal is less than 10 nm.

However, Yoshikawa disclose a method of forming electron device comprises the step of forming an electrode layer of Pt having a thickness of from 2 –20nm (overlaps the claimed range) (col 7, lines 53-55)

Since Peng discloses a step of forming a electrode layer of Pt, one skilled in the art would have found it obvious to modify Peng and Przybysz by forming a metal/Pt layer having a specific thickness as per Yoshikawa because Yoshikawa teaches that a thickness of 2-20 nm is the most suitable for the Pt thin-film electrode (col 7, lines 53-55)

6.. Claims 12-19, 21-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Peng et al (US 5,895,223) in view of Przybysz (US 4,353,779)

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Peng discloses a method of etching nitride (GaN/Group III-V material). This method includes the steps of:

partially coating the GaN chip with a metal electrode/layer of Pt (col 4, lines 7-18), which reads on depositing a thin discontinuous layer of metal on a Group III-V material surface

etching the GaN chip in a acidic solution of  $H_3PO_4$ , no voltage bias is required for the etching (col 4, lines 4-42), which reads on etching the Group III-V material surface in acidic solution , the etching being conducted without external electrical bias.

Since Peng does not disclose performing any additional step beside the above-mentioned steps, Peng method reads on the method consisting of the two steps.

Unlike the instant claimed inventions as per claims 12, 21, Peng does not disclose etching the Group III-V material in a HF and oxidant solution for a period of about 2 sec up to 60 minutes.

However, Przybysz discloses a method for wet chemical etching of Group III/V material comprises the step of etching Group III/V material (Ga) in a solution containing HF and  $H_2O_2$ /oxidizer for a period of 60 minutes (col 1, lines 60-65, col 4, lines 10-11)

Since both Peng and Przybysz are directed at methods of etching Group III/V material in an acidic solution, one skilled in the art would have found it obvious to modify Peng etching step by using the etching solution for a period as taught by Przybysz because Przybysz states that the amount of F- ion being effective to allow sharp uniform etching without precipitation or gaseous evolution at the etching site and the

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etching solution acts as a particularly effective solvent solution for GaAs/Group III/V material (col 5-11)

Regarding claim 13, Peng discloses that in one embodiment of his invention, the activation of the etching liquid by the UV light /illumination must be avoided (col 3, lines 56-58)

Regarding claim 14, Peng discloses the step of using UV light /illumination during the etching step (col 3, lines 43-45)

Regarding claims 15-18, Peng discloses that the metal electrode can be Pt, Au, Pd (col 4, lines 117-19)

The limitation of using an oxidizer of  $H_2O_2$  in the etching solution, as recited in claim 19, has been discussed above.

The limitations of claim 21 (etching time) and claim 22 have also been discussed above.

7. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Peng et al (US 5,895,223) in view of Yoshikawa et al (US 5,990,605 ) and further in view of Przybysz (US 4,353,779)

Peng discloses a method of etching nitride (GaN/Group III-V material). This method comprises the steps of:

partially coating the GaN chip with a metal electrode/layer of Pt (col 4, lines 7-18), which reads on depositing metal on a Group III-V material surface

etching the GaN chip in a acidic solution of  $H_3PO_4$ , no voltage bias is required for the etching (col 4, lines 4-42), which reads on etching the Group III-V material surface in acidic solution , the etching being conducted without external electrical bias.

Unlike the instant claimed invention as per claim 23, Peng does not specifically disclose that the thickness of the metal is a thickness sufficient to permit nucleation that forms nanometer size metal particles and small enough to prevent formation of a continuous metal layer/the nanometer size thickness

However, Yoshikawa disclose a method of forming electron device comprises the step of forming an electrode layer of Pt having a thickness in the nanometer size of from 2 –20nm (overlaps the claimed range) (col 7, lines 53-55)

Since Peng discloses a step of forming a electrode layer of Pt, one skilled in the art would have found it obvious to modify Peng by forming a metal/Pt layer having a specific thickness as per Yoshikawa because Yoshikawa teaches that a thickness of 2-20 nm is the most suitable for the Pt thin-film electrode (col 7, lines 53-55)

Peng and Yoshikawa do not disclose etching the Group III-V material in a HF and oxidant solution for a period of about 2 sec up to 60 minutes.

However, Przybysz discloses a method for wet chemical etching of Group III/V material comprises the step of etching Group III/V material (Ga) in a solution containing HF and  $H_2O_2$ /oxidizer for a period of 60 minutes (col 1, lines 60-65, col 4, lines 10-11)

Since Peng is directed to a method of etching Group III/V material in an acidic solution, one skilled in the art would have found it obvious to modify Peng and Yoshikawa by using the etching solution for a period as taught by Przybysz because



Przybysz states that the amount of F- ion being effective to allow sharp uniform etching without precipitation or gaseous evolution at the etching site and the etching solution acts as a particularly effective solvent solution for GaAs/Group III/V material (col 5-11)

### ***Response to Arguments***

8. Applicant's arguments filed 8/13/2003 have been fully considered but they are not persuasive.

Applicants argue that the examiner either misunderstands the reference /fails to appreciate the difference between material removal process and the formation of porous Group III-V and fails to make a prima facie case of the obviousness because there is not even a single applied reference that is directed to the formation of porous Group III-V. In response to this argument, the examiner asserts that there is no misunderstanding of the cited references, the reason that the references were applied in the rejection of the instant claimed invention although the references are not directed to the formation of porous Group III-V because the recitation of "for producing porous Group III-V material"/formation of Group III-V is recited in independent claims 1, 12, 23 as the preamble and the examiner notes that " a preamble is generally not accorded any patentable weight where is merely recites the purpose of a process or the intended use of a structure, and where the body of the claim does not depend on the preamble for completeness but, instead the process steps or structural limitations are able to stand alone" (MPEP 2111.02). Thus, the examiner maintains that the rejections of the instant claimed invention based on the cited references are proper because the

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recitation of "for producing porous Group III-V material" does not carry any patentable weight.

The applicants further argue that none of the material etching processes of the reference are assisted by nanometer sized metal nanoparticles. This argument does not commensurate with the scope of claims 1, 12, 23 because none of the claims require that the material etching process is assisted by nanometer sized metal nanoparticles.

In response to applicant's argument that there is no suggestion to combine the references of Peng and Przybysz, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, since the motivation to combine the references comes from Przybysz (see paragraph 4), one skilled in the art would have found it obvious to employ Przybysz's etching solution in Peng's method to produce the claimed invention.

It is argued that the examiner incorrectly points to the Pt in Peng as corresponding to the claimed step of depositing a thin discontinuous layer of metal on a Group III-V material surface because Peng merely teaches partially coating a limited area on the chip and the metal layer of Peng does not contribute to the etching process. The examiner disagrees because since Peng discloses partially coating the GaN/ Group III-V material using the same metal (Pt) as the claimed discontinuous metal layer and

Peng also disclose that the Pt layer raises the etching rate (col 4, lines 11-13), the examiner asserts that Peng's Pt layer reads on the claimed discontinuous metal layer.

The applicants argue that it is incorrect to point to the electrode layer 15 in Yoshikawa as corresponding to the claimed step of depositing metal on a Group III-V material in a thickness sufficient to permit nucleation that forms nanometer size metal particles and small enough to prevent formation of a continuous metal layer/the nanometer size thickness because Yoshikawa has a standard thin metal contact. This argument is unpersuasive for two reasons. First at all, since Yoshikawa discloses forming the metal layer 15 of the same material (Pt) as the claimed metal layer and the layer 15 also has the same thin thickness/ a thickness sufficient to permit nucleation that forms nanometer size metal particles and small enough to prevent formation of a continuous metal layer/the nanometer size thickness as the claimed metal layer (as defined in page 4 of the specification), the examiner maintains that Yoshikwa's layer 15 reads on the claimed metal layer.

The applicants also that Yoshikawa provides no suggestion to use a discontinuous metal layer in the formation of porous silicon or porous Group III-V. This argument does not commensurate with the scope of claim 23 because claim 23 does not recite " to use a discontinuous metal layer in the formation of porous silicon or porous Group III-V"

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

***Conclusion***

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lan Vinh whose telephone number is 703 305-6302. The examiner can normally be reached on M-F 8:30-5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton, can be reached on 703 305-2667. The fax phone numbers for the organization where this application or proceeding is assigned are 703 872-9310 for regular communications and 703 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703 308-

0661.



LV

November 2, 2003